United States Department of Agriculture
Forest Service

Sanpoil

Republic Ranger District

Colville National Forest

Fire, Fuels, and Air Quality Report

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Table of Contents

Tables

1.0 Introduction

This specialist report evaluates the effects to fuels and fire behavior as a result of the no action and proposed action alternatives on the project area's resilience to fire, and how effective the proposed treatments would be at lessening the effects of a wildfire that could result in a large scale loss of forest.

Fuels treatments would be aimed at compartmentalizing the project area into blocks that could provide opportunities to manage wildfires. Values at risk in and near the project area include Colville Confederated Tribal Lands, private land, Inventoried Roadless Areas, Brown Mountain Seed Orchard, and high use recreation areas such as the Pacific Northwest trail.

Fuels treatments in the Sanpoil planning area would address the need to lessen the effects of wildfire by reducing surface fuels, increasing crown base height, decreasing crown density and keeping larger, fire tolerant tree species. Table 1 below illustrates how treatments in the Sanpoil planning area would address resilient forests.

Table 1. Principles of Fire Resilient Forests (Agee, 2002 and Hessburg & Agee, 2003)

Principles	Effects	Advantage	Concerns
Reduce surface fuels	Reduce potential flame length	Control easier, less torching	Surface disturbance, less with fire than other techniques
Increase height to live crown	Requires longer flame length to begin torching	Less Torching (Torching is the initiation of crown fire.)	Opens understory, may allow surface wind to increase
Decrease crown density	Makes tree-to-tree crown fire less probable	Reduce crown fire potential	Surface wind may increase and surface fuels may be drier
Keep larger trees	Thicker bark and taller crowns	Increases survivability of trees	Removing smaller trees is economically less profitable

Where thinning is followed by sufficient treatment of surface fuels, the overall reduction in expected fire behavior and fire severity usually outweigh the changes in fire weather factors such as wind speed and fuel moisture (Weatherspoon, 1996).

2.0 Relevant Laws, Regulations, and Policy

2.1 Regulatory Framework

2.1.1 Colville National Forest Land Management Plan (LMP)

This report incorporates the LMP by reference and is tiered to the Land Management Plan's Final Environmental Impact Statement (USDA Forest Service 2019). Management direction for fire and fuels managers includes forest wide guidance as well as management allocation specific guidance. Fire and fuels generally do not drive management prescriptions but can assist in achieving the objectives described in the management area descriptions and plan direction (LMP 93-153).

Desired Conditions

The planning area is vulnerable to uncharacteristically severe wildfire and there are limited fire management opportunities within the planning area due to the abundance of surface, ladder and crown

fuels along strategic roads. Fire management opportunities need to be improved to prepare the landscape to interact with fire in a characteristic manner. Restoration and fuels treatment goals and objectives of the LMP are to move the Forest toward desired vegetative conditions and have landscapes dominated by Fire Regime Condition Class (FRCC) I (LMP 33-42).

Forest wide guidance from the LMP (FW-DC-VEG-11) for fire and fuels managers includes the following:

> Reduce surface, ladder and crown fuels that lower the potential for high-severity wildfires in wildland-urban interface areas, providing protection for communities and diversity within the stands. Generally, treated areas consist of open understories with overstory trees (conifers and hardwoods) populated by predominately fire resistant species, with scattered individual or small patches of shrubs and small trees in the understory, maintaining some cover in important wildlife corridors. Surface, ladder and crown fuels have been treated and maintained to allow low-intensity surface wildland fires (flame lengths of 4 feet or less). Vegetation has been modified (interrupted) to improve community protection and enhance public and firefighter safety (LMP 38).

The LMP (FW-OBJ-VEG-02) directs managers to initiate active management activities on 18,000 to 25,000 acres per year with fuels reduction activities on 5,000 acres annually in the wildland urban interface (WUI) to move toward desired vegetative conditions and have landscapes dominated by FRCC I (LMP 39).

2.1.2 The Clean Air Act

The Clean Air Act provides the principal framework for national, state, and local efforts to protect air quality and is administered jointly by the Environmental Protection Agency (EPA) and their designated state regulatory agencies. The Organization for Air Quality Protection Standards (OAQPS) is responsible for setting national ambient air quality standards (NAAQS) for pollutants which are considered harmful to people and the environment including ozone, carbon monoxide, particulate matter, sulfur dioxide, lead, and nitrogen oxides (USDA Forest Service 2000).

Three elements of the Clean Air Act generally apply to land management activities, such as prescribed burning, that produce emissions: (1) Protection of National Ambient Air Quality Standards (NAAQS), (2) Conformity with state implementation plans; and (3) Protection of visibility in Class I air sheds.

Class I airsheds include all International and National Parks greater than 6,000 acres in size, National Wilderness Areas greater than 5,000 acres, and other areas as designated by the EPA.

Places in violation of the air quality standards may be designated as a non-attainment area which may result in increased controls and limitations on the sources and amounts of emissions allowed.

The city of Spokane is the nearest non-attainment area. Smoke from prescribed burning in the Sanpoil project area would not affect the Spokane area, therefore NAAQS will not be addressed in this environmental assessment. The Washington Department of Natural Resources (WA DNR) would not approve burning if prevailing winds, volume of smoke, and smoke dispersion would affect Spokane.

The Pasayten wilderness is the closest Class 1 airshed approximately 80 air miles northwest of the project area. Due to the distance from the project area, smoke from prescribed burning in Sanpoil is unlikely to affect the Pasayten wilderness.

The Sanpoil analysis area is within an airshed that is regulated by the WA DNR – Smoke Management Division. All actions proposed as part of the Sanpoil project would comply with their requirements.

Prescribed fire planned by the Forest Service will follow standards set in the LMP (FW-STD-AIR-01). Activities comply with the national standards set forth in the Clean Air Act, and any State and local requirements for air pollution control. Planned ignitions shall follow all Washington State smoke regulations to reduce the potential impacts of smoke (LMP 29).

3.0 Analysis Framework

3.1 Purpose and Need

This specialist report addresses the purpose and need for the Sanpoil project which states there is a need to promote forest health and resiliency within the planning area to foster conditions that are less prone to disturbance events including insects, disease, and wildfire. This report also describes how activities will meet LMP direction to improve forest health and restore forests to their natural disturbance regime and forest type by moving stands closer to historic range of variability.

There is a need to start the process of moving stands towards fire resilient species, reversing the hazardous and expensive trend toward high-intensity crown fires by reducing fuel levels, stocking, and reintroducing historic disturbance regimes with use of hand, mechanical and prescribed fire treatments. As the probability of high severity wildfire increases, there is also increased risk of detrimental effects to key ecosystem components like watershed function and wildlife habitat.

The Sanpoil project helps achieve LMP direction by providing cost efficient options for fire protection including compartmentalization of large landscapes, treatment of activity fuels and consideration for public safety along important ingress-egress routes.

3.2 Issues

The scoping process did not identify any key issues related to fire or fuels management that would raise a point of disagreement or debate about the project, or identify potential undesirable environmental effects.

3.3 Other Resource Concerns

There were no other resource concerns identified during the project that were associated with law, regulation, or policy related to fire and fuels.

3.4 Resource Indicators and Measures

Table 2. Table of Resource Elements, Indicators, and Measures

Resource Element	Resource Indicator	Measure (Quantify if possible)	Used to address: P/N, or key issue?	Source (LMP S/G; law or policy, BMPs, etc.)?
Air Quality	Noncompliance or degradation	Compliance	Yes, Purpose and need	Clean Air Act, Washington State Smoke Management
Resiliency to wildfire	Stand conditions departed from healthy forest vegetation composition, structure, and density; fuel loading.	Move stands toward FRCC 1, (acres treated)	Yes, Purpose and Need	LMP p. 33-42
Firefighter and Public Safety	Fuels accumulation and continuity	Acres of commercial, non-commercial and fuels treatments	No	LMP p.39. Ferry County Community Wildfire Protection Plan

4.0 Methodology & Treatment Descriptions

4.1 Methodology

The methodology for determining fuel treatment effectiveness and need is based on the combination of effects related to how many fuels strata are being treated. The three fuel strata treatments being proposed for treatment are:

- Crown Fuels – Commercial treatments of the overstory
- Ladder Fuels – Non-commercial treatments of the understory
- Surface Fuels – Treatment of the surface fuels through pile burning and underburning.

The degree of effectiveness is then based on where these treatments overlap.

The intent of modeling fuel treatments is to show relative changes in fire behavior between the no action and the proposed action alternative. The outputs are not absolutes and are bound by the assumptions and limitations of data collection methods and individual models. However, they do allow for comparison of changes associated with different levels of fuel treatments.

Site-specific information collected in the summer of 2016 consisted of district fuels personnel setting up 13 fuel loading photo plots as well as conducting 115 fuels data evaluations on surface, ladder and crown fuels within the Sanpoil analysis area. This data was then used to verify and set priorities for non-commercial treatments.

The weather data below was recorded from the Iron Mountain RAWS station on Iron Mountain in the Sanpoil planning area and retrieved using Fire Family Plus, then used in fire modeling software IFTDSS and FVS-FEE.

Mortality 97th Wx (Mortality at the 97th Percentile Weather) -'Severe' mid to late summer weather parameters: 1-hr fuels: 4.3%; 10-hr: 6.6%; 100-hr: 7.3%; 1,000-hr: 9.9%; Duff: 15%; live fuels: 70%; Temp: 90F; 20-ft winds @ 25 mph (Iron Mountain RAWS).

Mortality 90th Wx (Mortality at the 90th Percentile Weather) – 'Moderate' early to mid-summer weather parameters: 1-hr fuels: 5.2%; 10-hr: 7.2%; 100-hr: 8.9%; 1,000-hr: 11.2%; Duff: 100%; live fuels: 100%; Temp: 85F; 20-ft winds @ 10 mph (Iron Mountain RAWS).

Several fuels and fire behavior models were used to assess potential surface, crown fire, rate of spread, fireline intensity torching and probability of initial attack success within the Sanpoil analysis area. These include:

Anderson's 13 Standard Fuel Models: mathematical models which represent a specific surface fuel profile. Used as an input to quantify potential surface fire behavior.

Fire Family Plus: Running this model is the best way to summarize RAWS station weather data trends over time.

Forest Vegetation Simulator – Fire and Fuels Extension: helps determine if stands are moved between different Fire Regime Condition Classes.

Interagency Fuels Treatments Decision Support System: used for modeling crowning, torching, rate of spread, and fireline intensity pre and post treatment.

Behave Plus5 assesses the potential success of suppression tactics based on fuels, weather and topography. Site visits spurred the need to run this model. We wanted to see if our treatments would be successful during initial attack under existing (pre-treatment conditions).

4.2 Treatment Descriptions

Prescribed Burning--Underburning

Underburning consists of igniting fuels at a measured pace during predetermined burning conditions. Underburning may be referred to as "jackpot burning" when fuels are distributed in patches and the patches are lit individually. The goals of underburning are to reintroduce fire into the ecosystem, reduce surface fuel loading created from tree removal activities, prepare seed beds for natural and planted regeneration, reduce natural fuel loadings and continuity, and/ or improve wildlife habitat and browse conditions.

Mortality caused by prescribed fire would typically occur in "clumps" or "patches" with differing degrees of severity (Finney et al, 2005). Historically a moderate severity patch may be up to 15 acres with mortality between 25 to 70%, and with high severity, patches less than 2 acres in size with mortality exceeding 70%. Underburning would favor fire-tolerant species (such as ponderosa pine and western larch) over fire intolerant species. Wind gusts, aspect changes, and slight differences in surface fuel loadings and arrangement across a unit affect fire intensity and severity.

Prescribed Burning – Maintenance Underburning

Maintenance underburning is the same as underburning but is used to maintain current conditions in a previously treated unit, using prescribed fire, to maintain a historic fire regime in the project area. Surface fuels would be light, reducing potential surface fire severity. Open timber stands would reduce the potential for sustained crown fires. Crown base heights would be increased through the use of prescribed fire. Species composition would favor fire-resistant species, such as Ponderosa pine, Western Larch and mature Douglas-fir. Fire-related tree mortality would be reduced through burning when environmental conditions such as air temperature and soil moistures would be conducive to a low to moderate intensity fire

Prescribed Fire

Prescribed fire units are areas where underburning is the only fuel treatment. Units may be ignited separately from other proposed treatment units and many are adjacent to units proposed for underburning as a follow-up to canopy or ladder fuel treatments. Including prescribed burn areas allows for greater continuity and opportunity for reintroducing fire in a larger landscape block, as opposed to several smaller and fragmented units. Furthermore, burning in larger landscape blocks decreases the need for fireline construction as there is a greater opportunity to use roads and natural features as fire breaks.

Many of these units lie in areas with limited to no road access and in rocky and broken terrain. If ignited, these treatments provide some surface and ladder fuel treatment in areas where no other fuel treatment is proposed.

In some instances these units have densely forested areas of a moist stand type. If these units are ignited, it would be under circumstances where only the more open forested areas would burn and fire would not be expected to carry consistently through the dense areas, resulting in mosaic burn patterns.

Piling of Fuels

Piling of fuels is a method of gathering limbs, tops, and whips (slash) from ladder fuel and canopy fuel treatments, and existing woody debris (natural fuels) for disposal. The piles are burned under safe conditions when fire is unlikely to spread; generally in the fall after conditions change to a damp weather pattern. Fuel piling may be done either with a machine, or by hand and are ignited by hand. In most cases, fuel piling occurs when terrain, access, or economics restrict the opportunity of fuel removal for biomass utilization, and when underburning is not feasible. A certain amount of large logs and other woody debris are retained on site to meet wildlife habitat and soil nutrient requirements.

Mechanical piling, also called grapple piling, is done by a machine that can pick up debris and place it on

a heap. If the piles are at designated landings, they can be much larger.

Hand piling occurs where fuels are hand piled and where prescribed fire or machine piling is not feasible due to slope steepness, resource concerns, or lack of access.

Lop and Scatter (decompose)

In units where fuel piling is proposed, the fuels after canopy or ladder fuel treatment may be light enough where piling and burning is not necessary. It is those instances where simply lopping the surface fuels into smaller pieces and spreading them out to decompose is a sufficient and cost-effective fuel reduction treatment. Lop and scatter may also be used in areas where fuels are too light to carry an underburn. In these areas lop and scatter would provide additional fuel to carry the fire. If not underburned, lop and scatter material would break down over time, providing soil nutrients and retaining soil moisture similar to mastication. It would moderate fire behavior, though it generally requires a few years to become flat enough on the ground for this to occur.

Shaded Fuel Breaks

Shaded fuel breaks would be created by reducing canopy and surface fuels in areas of strategic importance for wildfire containment. Standing live or dead conifers would be thinned to a spacing of 5-15 feet between the crowns of individual trees or small groups of trees. Deciduous shrubs and trees that tend to moderate potential fire behavior, would be retained to the extent practicable and are expected to benefit from conifer thinning. Trees of all sizes would be considered for cutting but would generally have small (less than 8 inches DBH) stem diameters. Trees and existing surface fuels may be masticated using machines or felled by hand (chainsaw) or machines. Slash would be piled by hand or machine and burned. Preference for tree retention would be based on tree species, crown quality, and/or canopy base height. Larger trees with thicker bark, higher crowns, and/or fuller, vigorous crowns would be preferred for retention.

4.3 Incomplete and Unavailable Information

There is no incomplete or unavailable information that would substantially change the assumptions or influence the effects conclusion.

4.4 Spatial and Temporal Context for Effects Analysis

The analysis area for the effects analysis for Fire and Fuels is the project area because treatments related to fire and fuels are not contained to units. The temporal scale for cumulative effects analysis for fire and fuels in Sanpoil is 30 years. The time frames associated with direct and indirect effects to fire and fuels treatments varies across the landscape depending on vegetation type and climate. Generally speaking fuel treatments need maintenance activities (burning, mechanical, etc.) that mimic historical fire return intervals. An example of this is low to mid elevation ponderosa pine, Douglas-fir and western larch forests that typically represent the low and mixed severity fire regime with average fire return intervals of 5 to 30 yrs.

The list of past, present, and reasonably foreseeable future projects in the Sanpoil area was reviewed.

5.0 Existing Condition

5.2 Existing Condition—Air Quality

Air quality in the area is generally good to excellent. However, locally adverse conditions can result from occasional wildland fires in the summer and fall, and prescribed fire and agricultural burning in the spring and fall. All major river drainages are subject to temperature inversions which trap smoke and affect

dispersion, causing local air quality problems.

Non-attainment areas that are relatively close to the Sanpoil analysis area include the Pasayten Wilderness 80 air miles WNW of the Sanpoil planning area and Spokane, WA, 60 miles to the south.

5.3 Existing Condition—Resiliency to Wildfire

Resiliency to wildfire is described in part by an analysis of fire regime and condition class. Historic fire occurrence in the project area also plays heavily into the development of current conditions.

The majority of the Sanpoil analysis area burned in the 1900's thru the 1920's. Historical research of the area surrounding this watershed indicates large fires were likely a natural occurrence prior to settlement. Due to fire suppression, fires in this area have been limited to relatively small events since 1930. Since 1930 approximately 50 fires have started within the Sanpoil Project Area. Only a handful of these fires burned more than one acre and 3 were less than 100 acres in size, with the exception of the White Mountain Fire in 1988, which burned 19,310 on the Colville National Forest, and burned 5,588 acres within the Sanpoil analysis area. With so little acreage burning since 1930, fuel loading within the project area is now higher than it would have been had the fires not been suppressed. Given that the fuel loading is higher across the landscape than historical levels, the risk of a larger and more costly fire has also increased.

Qualitative comparisons with aerial photographs from the 1930s to 2009, and field surveys indicate a general trend toward increasing forest cover, in areas that were not previously forested prior to the arrival of European settlements. This phenomenon is largely due to fire exclusion. Fire exclusion has allowed fuels to accumulate on the forest floor – the duff is thicker and the amount of down wood is probably greater (Smith and Fisher, 1997; DeLuca and Sala, 2006).

The second major observed effect of fire exclusion is the shift in species composition away from dominance in fire-resistant species such as ponderosa pine and western larch to a substantial increase in mistletoe Douglas-fir and beetle infested lodgepole pine. The warm-dry stands now have a relatively dense mid and understory component of grand fir and Douglas-fir.Stands of timber within the planning area have an overabundance of trees making them less healthy and therefore less able to resist uncharacteristically high levels of loss due to insects, pathogens, and wildfire.Many stands have been altered substantially from their historic range of variability by the suppression of wildfires over the past 100+ years, resulting in increased ladder fuels and growth of tree species that are less fire tolerant. This has resulted in a higher probability of increased fire size, frequency, and severity across the landscape.

Fire behavior and vegetation response is classified into three broad categories based on the severity of the fires characteristic to that regime. These categories are low, mixed (or moderate), and high severity fire regimes. Site productivity and fire frequency, or the amount of time between fire events, also plays an important role in the fire regime. In essence, the higher site productivities and longer fire frequencies generally allow for more closed canopy conditions. In contrast, marginal growth sites with short fire frequencies contribute to open forest canopy conditions.

High Frequency, Low Severity–Fire Regime 1

The ***high frequency, low severity fire*** regimes are those with a relatively short fire return interval (<35 years) and low fireline intensity. These fires have little effect on soil heating or overstory vegetation. Typically, 90% or more of the overstory vegetation survives this kind of fire (Morgan et al. 1996). Examples in the Sanpoil analysis area include south and west-facing slopes with an overstory of fire-tolerant ponderosa pine, western larch and Douglas-fir, and an understory dominated by low brush, and bunchgrasses. Fire exclusion has resulted in increased fuel loads in these stands. With a potential historic fire-return interval of 5 to 35 years, up to 10 fire cycles may have been eliminated from this ecosystem.

Mixed or Moderate Severity –Fire Regime 2

In mixed or moderate severity, fire regime's fire frequency and fire effects are variable across the landscape. Mixed severity fires are those with an intermediate return interval (35 to 75 years) and have a variable fire severity. Typically, this fire regime produces irregular stand patches and clumps resulting from different fire severities (Agee 1993). At local and landscape scales, mixed severity fire regimes produce spatially uneven mosaics of even-aged stands, where stand replacement severity occurs frequently in small patches (1 – 5 acres) or infrequently in larger patches (5 – 15 acres). The mixed or moderate severity fire regime occupies 43,637 acres or 91% of the Sanpoil analysis area. In these areas we are experiencing a moderate to dramatic departure (Condition Class II & III) from the HRV. Fire exclusion has resulted in an increase in ladder fuel abundance and continuity, currently conditions are such that these acres are at increased vulnerability to uncharacteristic disturbance, primarily fire. With a potential historic fire-return interval of 25 to 60 years, up to 6 fire cycles may have been eliminated from this ecosystem.

Mixed to High Severity–Fire Regime 3

The mixed to high severity fire regime is typically positioned on the landscape where the opportunity for ignition is limited. In the Sanpoil analysis area, shade-tolerant plant communities in moist or wet zones characterize these fire regimes. Wildfire usually only enters these areas during drought years, and can burn with high intensity (100+ years). The mixed to high severity fire regime occupies approximately 152 acres or less than 1% of the Sanpoil analysis area.

Fire Regime Condition Class (FRCC)

The FRCC is used to describe the degree of departure from the historic fire regimes that results from alterations of key ecosystem components such as composition, structural stage, stand age, and canopy closure. Table 3 describes the attributes of each FRCC. FRCC was validated using stand exam data, Colville National Forest Plant Association Groups (PAG), imagery, and local historical fire history records. It is important to note that the FRCC is highly variable across the Sanpoil analysis area; as with vegetation structure and composition, minor changes in slope, aspect, or topographic position can have dramatic effects on the vegetation potential of the landscape.

Fire regime is the characteristic fire trait occurring in an ecosystem. In other words, it is the general role wildland fire would play across a landscape in the absence of modern human intervention (Agee 1993).

Table 3. Fire Regime Condition Class Attributes

Condition Class	Attributes
1	Fire regimes are within or near their historical range. The risk of losing key ecosystem components is low. Fire frequencies have departed from historical frequencies (either increased or decreased) by no more than one return interval. Vegetation attributes (species composition and structure) are intact and functioning within their historical range.
2	Fire regimes have been moderately altered from their historical range. The risk of losing key ecosystem components has increased to moderate. Fire frequencies have departed from historical frequencies by more than one return interval resulting in moderate changes to one or more of the following: fire size, frequency, intensity, severity, or landscape pattern. Vegetation attributes have been moderately altered from their historical ranges.

3	Fire regimes have been substantially altered from their historical range. The risk of losing key ecosystem components is high. Fire frequencies have departed by multiple return intervals resulting in dramatic changes to one or more of the following: fire size, frequency, intensity, severity, or landscape pattern.

The surface fuel models within the Sanpoil analysis area include:

- Ponderosa pine/shrub cover types: FM 2 – long needle, shrub/grass layer.
- Ponderosa pine/Douglas-fir cover types: FM 9 – long needle litter and FM 5 – shrub layer.
- Douglas-fir/grand fir/western larch cover types: FM 5 – shrub layer, FM 8 – short needle litter and FM 10 – mixed conifer/dead-down/litter.
- Lodgepole pine, ponderosa pine, cover types: FM 8 – short needle litter and FM 10 – mixed conifer/dead-down/litter.

5.4 Existing Condition—Firefighter and Public Safety

Firefighter and public safety will be evaluated for this project based on acres of treatment. Important areas of consideration include where those acres fall on the landscape such as along ingress/egress routes, or near the WUI. The Sanpoil project falls within the Ferry County Community Wildfire Protection Plan (CWPP). Currently there are very few fuels treatments along ingress/egress routes inside the WUI. Fuels conditions here are generally dense with abundant ladder fuels creating conditions where, if left untreated, could result in degradation in ingress and egress routes. Approximately half of the project area is zoned "Rural WUI" within the CWPP. There are about 40 structures along Highway 21 in the Sanpoil River drainage to the west of the Sanpoil Analysis area, several of which are within a mile and a half of the project boundary. There are also about 25 structures to the east and northeast of the Sanpoil analysis area just off of Highway 20.

The Sanpoil project will help achieve the goals of the Ferry County CWPP including:

Reducing the potential for WUI land to be burned from wildfires by implementing strategically located fuels reduction treatments, and providing recommendations for alternative treatment methods such as modifying forest density, fuels reduction treatments, and removal of slash (Tucker, B & V. Bloch, 2014).

Table 4. Resource Indicators and Measures for the Existing Condition

Resource Element	Resource Indicator	Measure	Existing Condition
Air Quality	Noncompliance or degradation	Compliance	Meet Compliance
Resiliency to wildfire	Stand conditions of a healthy forest	Move stands toward FRCC 1, (acres burned)	Without treatments, stand conditions will continue to move from FRCC1 and 2, towards FRCC3
Firefighter and Public Safety/CWPP	Fuels accumulation and continuity	Commercial, non-Commercial and fuels acres treated	1,538 acres treated in the WUI

6.0 Design Elements

There are no design elements in this project for Fire, Fuels and Air Quality.

7.0 Environmental Consequences

7.1 Direct and Indirect Effects – Alt 1 No Action

A no action alternative would continue with a management policy of fire exclusion. This would result in no improvement in stand vigor and related forest health. Afforestation, inter- and intra-stand stocking levels and crown fire potential would continue to increase.

Table 5. Resource Indicators and Measures for Alternative 1

Resource Element	Resource Indicator	Measure	Alternative 1
Air Quality	Noncompliance or degradation	Compliance	Meet compliance, potential for substantial air quality degradation in the long term due to possible wildfires.
Resiliency to wildfire	Stand conditions of a healthy forest	Move stands toward FRCC 1, (acres treated)	Stand conditions will continue to move from FRCC1 and 2, towards FRCC3. No improvement in stand vigor or forest health
Fire Fighter and Public Safety/CWPP	Fuels accumulation and continuity	Commercial, non-commercial and fuels acres treated	No fuels treatments will be implemented in the WUI.

7.1.1 Direct and Indirect Effects – Air Quality—Alt 1

The activities associated with this alternative would have no immediate adverse impacts to air quality. The potential for substantial air quality degradation would increase in the long-term under this alternative. Without vegetative and surface fuel treatments designed to mimic the historical fire regimes, the trend may be for a large portion of the Sanpoil landscape to be at high risk to uncharacteristically severe wildfires. Consumption of relatively high levels of surface fuels and forest biomass during severe wildfire events could produce smoke and CO2 emissions far greater and longer than historical norms (Huff et al. 1995). In comparison to scheduled ignitions, unplanned ignitions (i.e. wildfires) can result in smoke emissions that are larger, occur at worse times for adequate dispersal, and have greater impacts on areas of human habitation than prescribed fires (Huff et al. 1995).

7.1.2 Direct and Indirect Effects – Resiliency to Wildfire —Alt 1

A no treatment alternative would continue with fire exclusion as the dominant anthropogenic disturbance on the landscape. Due to in-growth of primarily fire intolerant trees there is relatively high conifer stocking creating high connectivity of both ladder and crown fuels. Approximately 97% of the analysis area is indicative of FRCC 2. Stands would move from being moderately altered from their historic range of variability (FRCC2) toward a state where they are substantially altered (FRCC3) from their historic range of variability, where the risk of losing key ecosystem components is high and changes to fire size, frequency, intensity, severity or landscape pattern may occur.

7.1.3 Direct and Indirect Effects – Firefighter and Public Safety —Alt 1

Under the no action alternative, fuels accumulations would continue to shift away from grass, brush and hardwoods (fuel models 2/5/9) to a condition favoring high levels of coarse woody debris, litter, duff and ladder fuels (fuel model 10). In the event of a wildfire, higher fuel loads and crown fire hazards would reduce the ability to control the fire and increase associated risks to both firefighters and the public.

Past project records (within the recent past 10-30 years) from the Republic Ranger District indicate 5,836 acres have previously been treated including commercial thinning, group selection, improvement cut, seed tree cut, shelterwood, and clear cut. Previous WUI fuels treatments in the Sanpoil project area consist of 1,538 acres of chipping, piling, thinning and burning.

The risks of escape for all underburning would be minimized by using common firefighting tactics to limit fire spread. Safeguards to contain fire may include firelines, black lines, wet lines, natural barriers, or roads. Burning is done when weather and fuel moisture conditions make unmanageable fire behavior unlikely, such as during spring or fall. Burns are monitored until they can be declared out, which may include night time staffing. To reduce possible large tree mortality from prescribed fire, slash pullback and raking around large or desirable trees may be done as deemed necessary.

The greater the fuel loading, the more intense a fire is likely to burn (DeBano et al., 1998). Conversely, a reduction in fuel loading can limit a fire's intensity. Fuel characteristics affecting fire behavior are vegetative density, species composition, amount of surface fuel, arrangement of fuels and moisture content (Rothermel, 1983). Fuels contribute to the rate of spread of a fire, the intensity and flame length of the fire, how long a fire is held over in an area, and the size of the burned area (Rothermel, 1983).

7.2 Direct and Indirect Effects – Alt 2 Proposed Action

This alternative proposes hand, mechanical and underburning fuels treatments totaling 19,129 acres. 8,666 acres are proposed for underburning; 1,984 acres of the underburning will be maintenance burning in previously treated Eagle Rock units. 8,163 acres are proposed for a combination of hand thinning, piling, and burning, and mechanical thinning, piling and burning.

Roadside shaded fuel break treatments support goals identified in the Ferry County CWPP as important routes for safe access/egress for responding firefighting personnel and alternate escape routes for the public specifically including the Hall Creek and McMann Creek roads (Tucker, B & V. Bloch, 2014).

Table 6. Treatments in the Proposed Action (Alternative 2)

Treatment	Descriptive Code	Acres
Silvicultural Treatments		
Commercial Thinning	CT	3,846
Commercial Thinning with Openings	CT-O	1,270
Pre-commercial Thin	PCT	2,520
Small Pole Thinning	SPT	519
No Silvicultural Treatment	NT	39,546
	Total	47,956
Fuels Treatments		
Shaded Fuel Break	SFB	2,270
Ladder Fuel Reduction	LFR	30
Machine Pile, Burn	MPB	7,256
Hand Pile, Burn / Machine Pile, Burn	HPB/MPB	463
Underburning (Includes Eagle Rock Maintenance and Landscape Natural Fuels)	UB	8,666
	Total	19,129*

*some fuels treatments listed in this table overlap, total acres does not represent unique acres treated.

The McMann shaded fuel break is planned to bolster fuels reduction work that has been done on private property adjacent to Forest Service land in the Sanpoil planning area. This shaded fuel break treatment has the potential to reduce fire behavior in the rural WUI identified in the Ferry County CWPP (Tucker, B & V. Bloch, 2014).

Shaded fuel breaks will have a mix of HPB, MPB and UB treatments. See Table 7 for miles treated. Shaded fuel breaks respond to the Ferry County Community Wildfire Protection Plan and would be

created along travel corridors with strategic importance for wildfire containment. Shaded fuels breaks are intended to increase the probability that potential fire behavior in the treated area would be moderate enough to allow for direct attack or burnout operations under typical fire-season conditions (Moghaddas & Craggs, 2007). In addition, shaded fuel break treatments would have the following objectives: safe egress of National Forest visitors or personnel in the event of a wildfire occurring, improved outcomes for natural resources relative to fuelbreak construction activities conducted under emergency circumstances, and increased operational safety and effectiveness of wildfire containment tactics in the likely event of an incident.

Table 7. Roadside Shaded Fuel Breaks Miles Treated by Road

Road Number	Miles Treated
2053-000	14
2050-600	7
2054-000	8
2100-500	3
C-99	4
Total Miles	36

Proposed underburning of landscape natural fuels will focus on reintroducing fire to the landscape in an effort to build resiliency to both fire and disease.

Table 8. Underburning by Treatment Type

Type of Burning	Descriptions of treatments	Units
Shaded Fuel Break	Burning along roadside	58, 90, 150, 191, 229, 531, 537, 540, 541, 542, 549, 550, 551, 529, 548, 552, 554, 555, 559, 567, 557, 560, 562, 563, 565,
Underburning Eagle Rock Maintenance Burn	Maintenance burning	53, 54, 55, 61, 189, 190, 226, 227, 360, 477, 530, 533, 536, 561, and 566
Underburning following commercial treatment	Treating activity generated fuels	2, 3, 13, 61,64,70,177,187,188,189,227,342,345,360,445,447
Underburn Landscape Natural Fuels	Treat fuel loads to mimic fire's natural role	3, 13, 27, 36, 39, 40, 44, 64, 70, 177, 178, 187, 188, 192, 229, 338, 342, 345, 445, 534, 535, 544, 545, 546, 547 and 551

Included in the proposed underburn units are previously treated Eagle Rock units that have had a mix of commercial treatment and non-commercial fuels treatments in the late 90's and early 2000's. Reintroducing prescribed fire to the Eagle Rock units 53, 54, 55, 61, 189, 190, 226, 227, 360, 477, 530, 533, 536, 561, and 566 (1,984 acres) will maintain stand conditions that would allow the continued use of prescribed fire in the future to maintain ecosystem health and reduce fuel accumulations. Prescribed burning and commercial harvest has been used in the past to create the conditions that exist today. Implementation of this project would perpetuate these conditions for another 10-15 years, thereby maintaining historic fire intervals.

Units identified for underburning will initiate the process of moving stands towards the desired FRCC 1 condition. These first entries will not complete the move to FRCC1 but will start the transition to the

desired condition.

Table 9. Resource Indicators and Measures for Alternative 2

Resource Element	Resource Indicator (Quantify if possible)	Measure (Quantify if possible)	Alternative 2
Air Quality	Noncompliance or degradation	Compliance	Meet Compliance
Resiliency to wildfire	Stand Conditions of a Healthy Forest	Move Stands toward FRCC 1, (Acres Burned)	8,666 Acres Underburning 8,163 Piling and Burning
Firefighter and Public Safety	Fuels accumulation and continuity	Commercial, Non-Commercial and Fuels Acres Treated	2,270 acres shaded fuel break

In general, units designated for under burning contain a high percentage of fire tolerant residual trees such as western larch, ponderosa pine and Douglas-fir while units prescribed for mechanical treatments may contain a high percentage of residual fire intolerant species such as lodgepole pine, and grand fir. Prescribed fire might not be used in harvest units that consist of predominantly shade-tolerant trees, where the overstory tree morality would be expected to exceed 10 percent.

7.2.1 Direct and Indirect Effects—Air Quality – Alt 2

The Sanpoil analysis area is within a designated Class II airshed. The nearest Class I airshed is the Pasayten Wilderness 80 air miles to the WNW. Smoke originating within and/or potentially impacting this airshed is regulated by the Washington Department of Natural Resources – Smoke Management Division (WA DNR). The existing sources of particulate emissions within and/or near the Sanpoil analysis area include smoke from neighboring prescribed fire projects including, but not limited to, forest residue burning on National Forest System (NFS) and non-NFS ownerships; smoke from residential wood stoves and agricultural activities in the Sanpoil River valley (Republic, Curlew, Malo, Torboy, Danville, etc.); and vehicular dust and exhaust.

The potential for smoke intrusion into a non-attainment area or Class I airshed from proposed activities would be negligible due to distance and the prevailing southwest winds. Smoke and other airborne particulates originating from proposed activities within the Sanpoil analysis area would normally be carried to the northeast, away from Class I airsheds and non-attainment areas.

Smoke from prescribed fire activities may temporarily settle within the Sanpoil analysis area and nearby Sanpoil River valley (Republic, Malo, and Curlew). Nevertheless, potential impacts to air quality from prescribed fires would be reduced due to reduced fuel consumption within a given area and by redistributing the emissions through meteorological scheduling and coordination with the WA DNR.

Meteorological scheduling is often the most effective way to minimize direct smoke impacts to the public (Ottmar et al. 2001). Prescribed burns would be scheduled and approved by the WA DNR during periods of good atmospheric dispersion (dilution), and when prevailing winds are forecasted to transport smoke away from sensitive areas (avoidance). In addition, total emissions from proposed activities would be spread out over a one to ten year implementation period.

Socio-political considerations and/or unfavorable changes in transport winds may necessitate a curtailment in prescribed burning at the local level. This would be determined on a case-by-case basis with a change in forecasted burn conditions communicated to the WA DNR.

Proposed activities meet or exceed the requirements of the Clean Air Act through compliance with air quality standards regulated by the WA DNR. Burn plans, outlining required weather and fuel parameters for desired fire and smoke effects, would be prepared and approved for each prescribed burn. Prescribed burning would also be consistent with State laws requiring treatment of activity created fuels. The

federally mandated Environmental Management System (EMS) is an ongoing process that formalizes the Forest Service's commitment to adaptive management and continual improvement of the environment. The EMS uses ISO 14001 international standard to account for performance through monitoring, auditing and management reviews. Smoke produced from proposed prescribed burn activities would be subject to EMS requirements including compliance and documentation of all WA DNR (Smoke Management) permitted pre and post burn activities.

7.2.2 Direct and Indirect Effects—Resilience to Wildfire—Alt 2

The proposed action would result in an improvement in stand vigor and related forest health. Inter and intra-stand stocking levels and crown fire potential would decrease. Treatments that reduce surface fuel loads have been shown to decrease fire behavior and severity (Graham et al., 1999; Pollet and Omi, 1999).

The removal of non-commercial, pre and post-harvest fuels by, piling, and/or underburning are proposed for up to 19,129 acres. The treatment of these fuels will help move FRCC's away from their current departed condition (FRCC 2 and 3) towards a more historical, less departed condition of FRCC 1 where risk of losing key ecosystem components is low, vegetation attributes are functioning within their historical ranges, and fire regimes are within or near their historical range. Moving stands towards FRCC 1 would make fire tolerant stands more resilient to insects, disease and large wildfire.

These treatments, along with the silvicultural pre-commercial thinning are expected to reduce surface and ladder fuel biomass within the drier stand types. Subsequent conifer regeneration should also shift toward more fire tolerant species. Up to 1,825 acres are proposed for maintenance burning in previously treated Eagle Rock units. These maintenance treatments will help maintain the current FRCC 1 condition. Intensive forest management that involves the creation of activity fuels (slash) can indeed increase fire behavior conditions such as rate of spread and flame length. However, treatment of slash (i.e. burning, chipping, removal, isolation) will reduce fire behavior and fire intensity (Omi and Martinson, 2002). Graham et al. (1999) reports that thinning from below and intermediate tree harvest can effectively alter fire behavior by reducing crown bulk density and ladder fuels, but will not reduce crown fire potential unless tree densities are substantially reduced. The same scientific document also states that all intermediate treatments should be accompanied by surface fuel modification, and the most success is achieved when using prescribed fire for such treatments.

In skyline units that are not being proposed for under-burning or mechanical treatments, an effective fuels treatment alternative would be to whole tree yard material to landing piles, in order to reduce the fuel loading within the unit post-harvest. Whole tree yarding would reduce surface fuels loading and may reduce future mortality of fire intolerant species during a wildfire event.

These treatments, along with the silvicultural pre-commercial thinning are expected to reduce surface and ladder fuel biomass within the drier stand types and should move FRCC's 2 and 3 stands toward FRCC 1. Subsequent conifer regeneration should also shift to a more fire tolerant cohort. Up to 1,825 acres are proposed for maintenance burning in previously treated Eagle Rock units. These maintenance treatments will help maintain the current FRCC 1 condition.

7.2.3 Direct and Indirect Effects—Firefighter and Public Safety—Alt 2

In the case of a large stand-replacing wildfire, it may become necessary to establish a primary or secondary holding feature along previously treated harvest units, fuels treatment areas, roads, or geographic features. If this were to happen it would most likely be necessary to treat the fuels right up to the road edge before they could be effective as a holding and/or ignition point.

Treatments proposed as part of the Sanpoil project would reduce the risk to firefighters and the public and provide more strategic options for fire managers to manage wildfire on a larger scale. The proposed

shaded fuel breaks associated with roadside treatments is intended to create a safe opportunity for firefighters to engage a wildfire located within the Sanpoil planning area. These shaded fuel breaks are not intended as an area to stop wildfire, but to allow an area for firefighters to safely engage or access a wildfire. When these shaded fuel breaks are completed, they would create an area where potential for torching was reduced from 65% to only 25% of the area; flame lengths were reduced from 1-4 feet on 60% of the area to 1-4 feet on 80% of the area; and intensity was reduced on many acres. Rate of spread increased slightly in some areas due to the reduction in crown density, allowing for grasses and forbs to expand in areas, where previously they were less abundant. If the fire should escape initial attack, the shaded fuel break could be used as a fireline, reducing the need for more firefighting resources and reducing the amount of exposure to fire personnel. The shaded fuel break will also allow for quicker ingress and egress for firefighters and the public by increasing visibility along the roadways.

7.3 Environmental Consequences—Cumulative Effects—Alt 2

7.3.2 Cumulative Effects—Air Quality

The cumulative effects analysis area for air quality is the Kettle Crest west of Lake Roosevelt. Smoke dispersion is usually limited by basins and drainages as well as air movement patterns. The nearest non-attainment areas are between 60 and 80 miles away, too far to have any measurable chance of being affected by prescribed burning in the Sanpoil project.

The resulting effects could include additional smoke in the air if burning were conducted during the same time period. For example the Sherman project just north of Sanpoil also includes prescribed burning.

Additionally, treatments on Colville Confederated Tribal lands will involve fuels treatments. Washington state smoke management regulators take into account what fuels treatments the Colville Confederated Tribes are implementing and approve prescribed burning on federal lands accordingly.

If burning were to occur on the same day or during the time when smoke was dispersing, each burn unit would be approved by the Dept. of Natural Resources and would take into account atmospheric circulation patters, trajectory of smoke emissions, and how quickly smoke dissipates to harmless levels. When regional haze and/or particulate counts are high, additional smoke emissions are prohibited. Cumulative effects may be limited, lasting one day or one week, and will remain below thresholds set by the Washington State smoke management plan. For these reasons cumulative effects are not expected to be significant.

Prescribed burns in the Sanpoil project area would be scheduled and approved by the WA DNR only during periods of favorable atmospheric transport and dispersion. To ensure compliance with State and federal air quality standards, approved burning would be determined through monitoring and computer modeling of all scheduled and proposed emissions. This includes proposed burns from State, private and federal ownerships. For an “average” spring or fall burn prescription, NAAQS for PM10 permits ignition of up to 500 acres of Fuel Model 11/12 (activity fuels) or 750 acres of Fuel Model 2/5/8/9/10 (natural fuels). Historically, less than 100 acres are ignited on the district on a daily basis due to cumulative smoke considerations and/or limited resource capabilities.

7.3.2 Cumulative Effects—Resilience to Wildfire

The cumulative effects analysis area for resilience to wildfire is the Sanpoil project area. Resilience to wildfire correlates to FRCC changes at the stand and project level due to site specific treatments. Strategic choicesmade during wildfire suppression events and maintenance of fuels treatments can influence outcomes of wildfire. The scale of large fires is often affected by major road systems, past harvest treatments, and strategic fuel breaks. Large fires often occur on a scale similar to the project area. There may be cumulative effect to fire and fuels due to the potential overlap in space and time with other fuels treatment activities (Sanpoil Silviculture Report, Pfeifer 2020). Activities listed in the Past, Present and Reasonably Foreseeable Future Activities in the Sanpoil EA were considered. Any other fuels treatment

would only improve conditions for fire suppression.

7.3.3 Cumulative Effects—Firefighter and Public Safety

The cumulative effects analysis area for firefighter and public safety is the Sanpoil project area. The ability for ground forces to engage, or forest users to be safely evacuated, during any given incident is usually determined by ingress/egress routes, hazards on site, and stand conditions. Strategic decisions on large fires may influence the use of ground forces. These decisions often occur at scales similar to that of the Sanpoil project area. There may be cumulative effects to firefighter and public safety due to the potential overlap in space and time with other project's fuels treatments associated with existing harvest activities. Projects listed in the Past, Present and Reasonably Foreseeable Future Activities in the Sanpoil EA were considered. Activities that could affect freighter and public safety include ongoing treatments authorized under previous analyses including commercial, or non-commercial vegetation manipulation and fuels treatments. The cumulative effect would be to reduce different layers of fuels in the canopy, ladder fuels, or surface fuels, resulting, in most cases, in more acres in the project area having a decrease in potential fire intensity, potential crown fire, or potential flame length.

Using a model to consider areas within 500 feet of either side of the 2053 road based on LandFire data, flame lengths were expected to be greater than 25 feet (7.6 meters) on a third of the area, greater than 4 feet (1.2 meters) on a third of the ground, and greater than 1 foot (0.3 meters) on a third of the ground. See Figure 1.

Direct attack on head or flanks by firefighters is considered possible on flame lengths 4 feet or less. 4-8 foot flame lengths, Dozers, fire engines and retardant may be effective. Before treatment, fires occurring on about 60% of this area could be suppressed by ground forces. After treatment, fires occurring on about 85% of the area within 500 feet of the 2053 road could be suppressed with ground forces (Figure 2). In addition, the percent of the area expected to see torching or crown fires (greater than 11foot flame lengths) was cut in half from 22% to only 10%.

Figure 1. Before Treatment – Anticipated Flame Length within 500 feet of Either Side of the 2053 Road

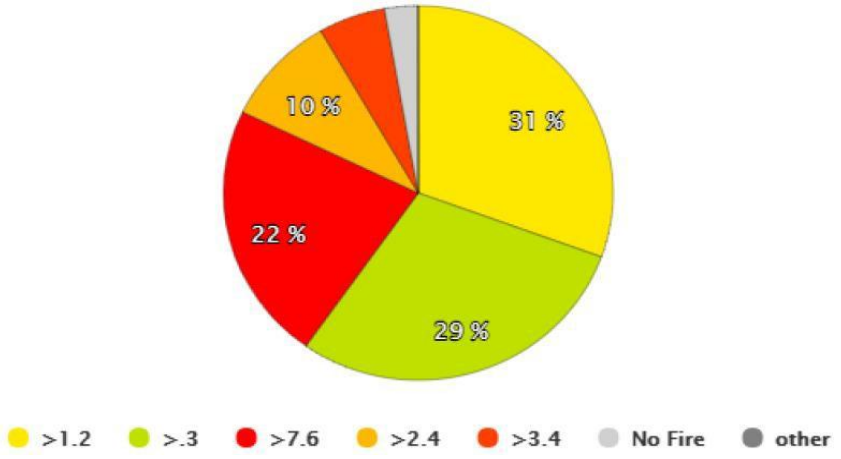
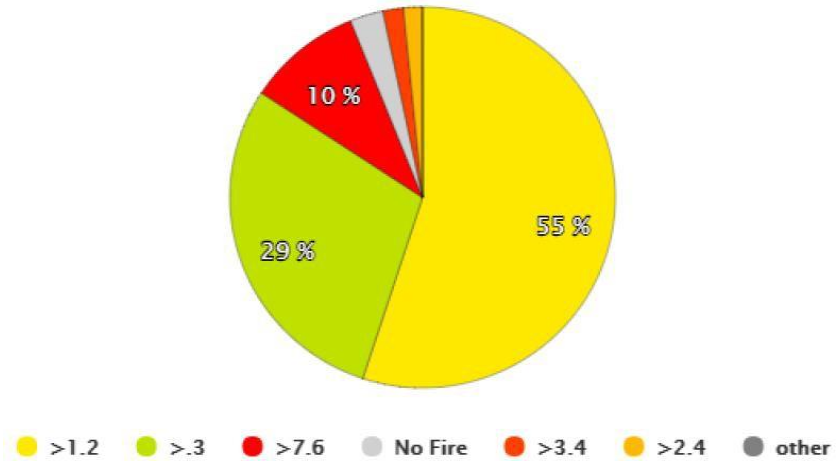


Figure 2. After Treatment (Heavy Thin)—Anticipated Flame Length within 500 feet of Either Side of the 2053



The same topographical footprint was evaluated for anticipated spread rates before and after treatment.

Before treatment rate of spread was between 2 and 5 chains an hour over approximately 60% of the treatment area. A 20-person hand crew can easily outpace this spread rate when putting in direct fireline. 24% percent of the area had a spread rate of 20 chains an hour which requires the use of fire engines, heavy equipment or aviation resources such as helicopters or retardant/suppression aircraft.

After treatments, 55 % of the treatment area had spread rates of 2-5 chains an hour, but the 20 chains an hour spread rate area increased from 24% to 33%. This increase in rate of spread is mainly due to the reduction of ladder fuels and some of the forest canopy, opening up areas for grasses and shrubs which have a higher spread rate than trees and large down woody debris. Rates of spread would increase after treatment, but crown fire potential and fireline intensity also decreased after treatment. Successful direct attack by hand crews putting in direct line is affected by a combination of factors including flame length, rate of spread, fireline intensity and crown fire potential. Direct attack may still be successful in areas with faster rates of spread if fireline intensity remains low and the fire front stays on the ground rather than transitioning into a crown fire.

16 m/min = ~ 43 ch/hour

6.7 m/min = ~ 20 ch/hour

1.7 m/min= ~ 5 ch/hour

.7 m/min = ~ 2 ch/hour

Figure 3. Before Treatment—Anticipated Spread Rate (m/min) within 500 feet of either side of the 2053 Road

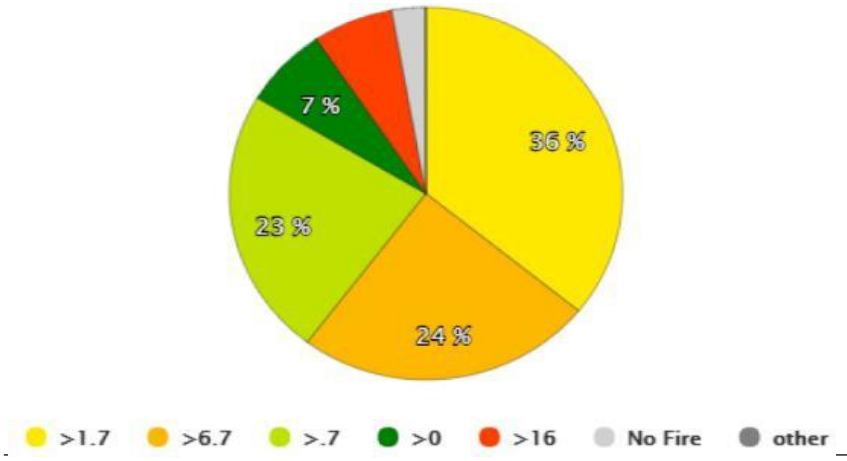
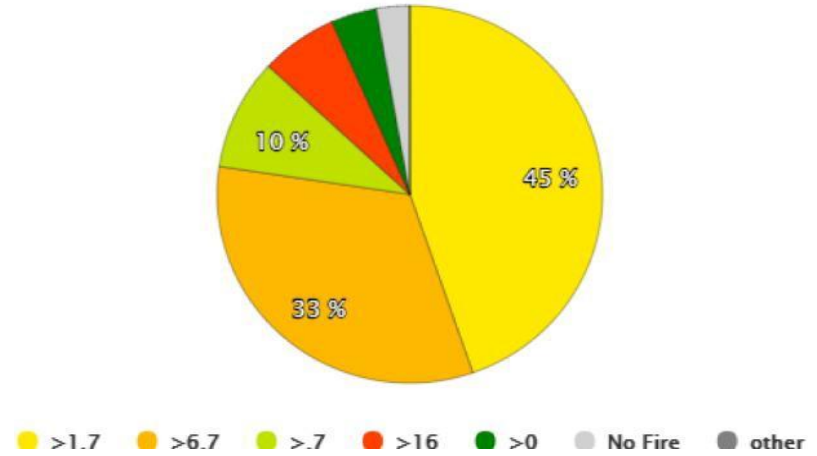


Figure 4. After Treatment (Heavy Thin) —Anticipated Spread Rate (m/min) within 500 feet of either side of the 2053 Road



The same topographical footprint was evaluated for anticipated fireline intensity before and after treatment.

Before treatment, 70% of the treated area (>350 kW/m) can generally be attacked at the head or flanks by persons using hand tools. After treatment 86% (>350 kW/m) of treated area can generally be attacked at the head or flanks by persons using hand tools. Fire intensities over 350kW/m requires equipment such as dozers, engines and retardant air craft to be successful.

Figure 5. Before Treatment—Anticipated Intensity (kW/m) within 500 feet of either side of the 2053 Road

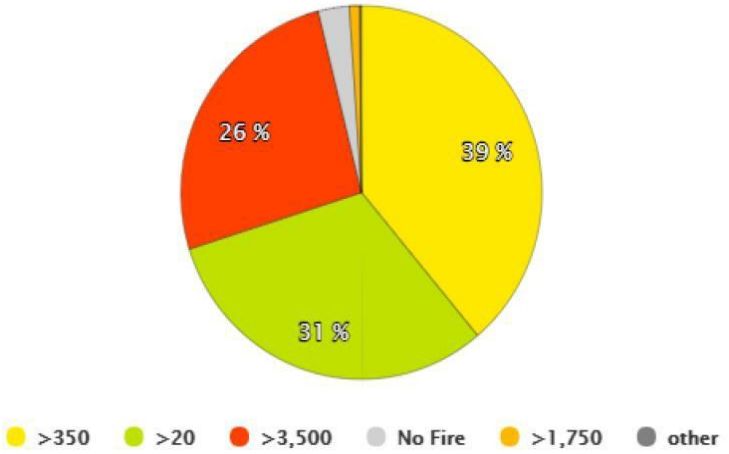
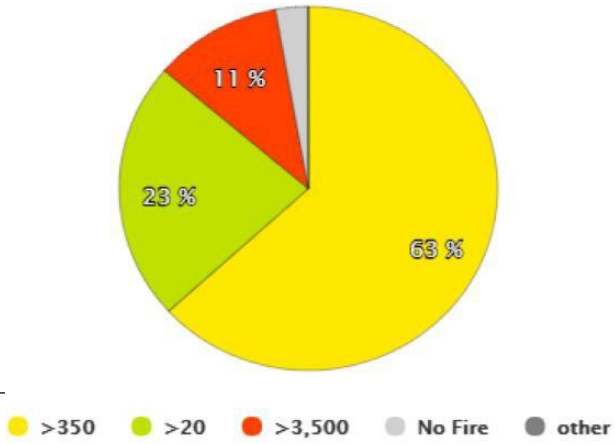


Figure 6. After Treatment—Anticipated Intensity (kW/m) within 500 feet of either side of the 2053 Road



The same topographical footprint was evaluated for anticipated Crown Fire Potential before and after treatment.

Before treatment passive crown fire was possible on 65% of non-treated area. After treatment passive crown fire was only expected on 25% of the area. Passive crown fire is a fire in which individual or small groups of trees torch out, but solid flaming in the canopy cannot be maintained except for short periods.

Figure 7. Before Treatment—Crown Fire Potential within 500 feet of either side of the 2053 Road

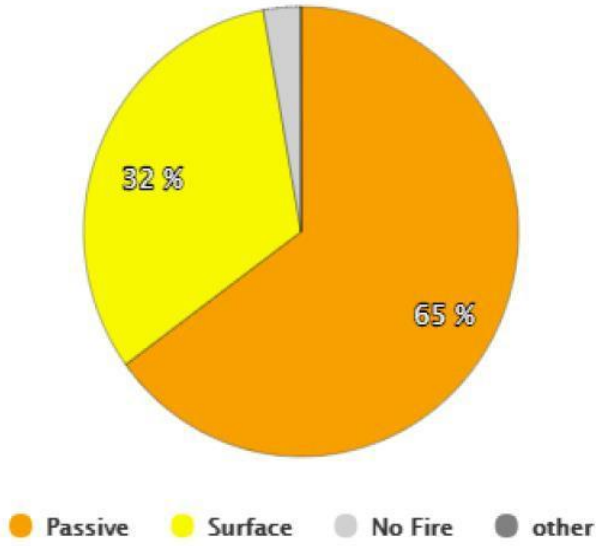
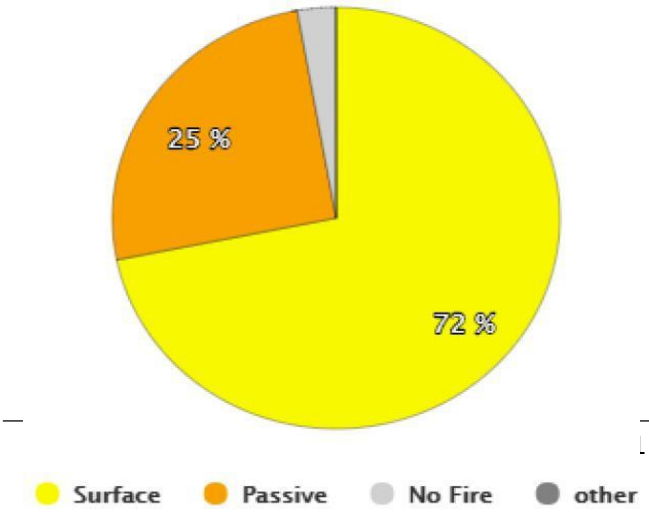


Figure 8. After Treatment—Crown Fire Potential within 500 feet of either side of the 2053 Road



8.0 Summary

8.1 Summary—Alt 1

Alternative 1 would not address the air quality, forest's resiliency to disturbance, or firefighter and public safety, nor would it meet Forest Plan direction to improve forest health to its natural disturbance regime and forest type by moving stands closer to the historic range of variability; Air quality would continue to remain the same (meeting air quality standards). The WUI would continue to degrade due to increase in fuel loading, and roads would continue to limit access and add additional risk to fire fighter and public safety. The forest's resilience to wildfire would continue to decline due to insect, disease and increased fuel loading.

Alternative 2 proposes underburning, mechanical and non-mechanical treatments as well as initiating maintenance burning in the Eagle Rock units would help maintain and move stands toward FRCC 1. The proposed shaded fuel breaks along the key ingress and egress routes would allow firefighters to engage a wildfire during initial attack or take strategic suppression action on a fire incident around the treated area. The shaded fuel break is not intended to stop a wildfire, it is intended to create defensible space and create an opportunity for firefighters to safely engage wildfire.

Air quality has a low probability of being impacted during fuels treatments, because fire managers will follow policy and direction from Washington State Smoke Management and get clearance before any prescribed fire operation begin.

Firefighter and public safety would improve with the proposed post-harvest and hazardous fuels reduction plans. Reducing crown, ladder and surface fuels reduces fire intensity allowing fire fighters to safely engage fire during initial attack, reduces the number of fire fighters needed to control the fire, which lessons the exposure on firefighters and the public.

Forest resilience to wildfire would improve with the proposed post-harvest and fuel treatments by moving stands closer to historic fire regimes, reduce encroachment of fire intolerant species and reduce fuel loading across the landscape.

8.1 - Degree to Which the Purpose and Need for Action is Met

Table 10. Summary comparison of how the alternatives address the purpose and need

Purpose and Need	Resource Element	Resource Indicator	Measure	Alternative 1	Alternative 2
Promote forest health and resiliency within the planning area to foster	Air Quality	Noncompliance or degradation	Compliance	N/A Air Quality analysis is a regulatory requirement	
	Resiliency to wildfire	Stand conditions of a healthy forest	Move stands toward FRCC 1, (acres burned)	Stand conditions will continue to move from FRCC1 and 2, towards FRCC3, away from desired conditions and towards a landscape that is less resilient to disturbance	8,666 acres underburn 8,163 acres pile burn 5,890 acres harvest. Treatments trend to FRCC 1 increasing resilience to wildfire disturbance

Purpose and Need	Resource Element	Resource Indicator	Measure	Alternative 1	Alternative 2
conditions that are less prone to disturbance events including insect, disease and wildfire	Firefighter and Public Safety	Fuels accumulation and continuity	Commercial, non-commercial and fuels acres treated	1,538 acres treated in the WUI, while treatment in the WUI may protect infrastructure, in most cases, these treatments are not along strategic roads. Therefore WUI treatments that will occur independent of the Sanpoil project will not substantially reduce the susceptibility of this area to disturbance.	There are 2,270 acres of shaded fuel break treatments along 36 miles of roads in the project area. By treating along strategic roads, the potential for fire suppression activities to be successful increases, thereby reducing the potential for large scale disturbance that could affect the forest health of the planning area.

8.2 Degree to Which the Alternatives Address the Issues

Fire and Fuels was not connected to an issue that drove an alternative for the Sanpoil project.

8.3 Summary of Environmental Effects

Table 11. Summary comparison of environmental effects to fuels

Resource Element	Resource Indicator	Measure	Alt 1	Alt 2
Air Quality	Noncompliance or degradation	Compliance	Air Quality would not be affected.	Treatments would meet air quality standards and guidelines
Resilience to Wildfire	Stand Conditions of a Healthy Forest	Move Stands toward FRCC 1, (Acres Burned)	Stand conditions will continue to move From FRCC1 and 2, towards FRCC3, away from desired conditions and towards a landscape that is less resilient to disturbance	8,666 acres underburn 8,163 acres pile burn 5,890 acres harvest. Treatments trend to FRCC 1 increasing resilience to wildfire disturbance
Firefighter and Public Safety	Fuels accumulation and continuity	Commercial, non-commercial and fuels acres treated	1,538 acres treated in the WUI. While treatment in the WUI may protect infrastructure, in most cases these treatments are not along strategic roads. Therefore, WUI treatments that will occur independent of the Sanpoil project will not substantially reduce the susceptibility of this area to disturbance.	There are 2,270 acres of shaded fuel break treatments along 36 miles of roads in the project area. By treating along strategic roads, the potential for fire suppression activities to be successful increases, thereby reducing the potential for large scale disturbance that could affect the forest health of the planning area.

9.0 Compliance with LMP and Other Relevant Laws, Regulations, Policies and Plans

FSM 5140.2; Hazardous Fuels Management and Prescribed Fire

Objective 1 in the FSM 5104.2, Understands the role of fire on the landscape as a critical natural process, in land and resource management planning and the need to develop achievable and sustainable fuels projects in order to integrate fire, as a critical natural process, into Land Management Plan (LMP) objectives. This would provide for landscapes which are resilient to fire related disturbances and climate change.

We are meeting objective 1 in Sanpoil by planning and implementing up to, 8,666 acres of underburning projects that will introduce fire back onto the landscape and reduce fuels associated with post-harvest activities.

Objective 2 in the FSM 5104.2, In, cooperation with partners, strategically plan and implement on a landscape scale, risk-informed, and cost-effective hazardous fuel modification and vegetation management treatments (wildland fire (wildland and prescribed), mechanical manipulation, biological and chemical) to attain management objectives identified in the Land Management Plans, to protect, sustain and enhance resources and where appropriate, emulate the ecological role of natural fire.

We are meeting objective 2 in the FSM 5104.2 by strategically planning and implementing 8,163 acres pile burning acres of fuels treatments that protect sustain and enhance resources. The fuels units are strategically located in areas that could aid in the support of wildfire suppression and protection of resources.

FSM 5141.1 Hazardous Fuels Management and Prescribed Fire Planning

FSM 5141.1 Overall direction for hazardous fuels management and prescribed fire is provided by the Land/Resource Management Plan. The LMP serves as the document to initiate, analyze, and provide the basis for implementing hazardous fuels management and prescribed fire project to meet resource management objectives.

We will meet the direction in FSM 5141.1 by adhering to the resource management objectives during the implementation of any hazardous fuels or prescribed fire project.

FSM 5142.8 Smoke Management

Coordinate prescribed fire program activities with Regional air quality specialists and Federal, State, Tribal air pollution control district or count regulator authorities to ensure compliance with regulations which are supported by the Clean Air Act.

We will meet the direction of FSM 5142.8 by coordinating with Washington State Smoke Management to get clearance for any days we decide to burn.

Colville National Forest Land Management Plan

Desired conditions, Objectives, Guidelines, Standards, and Suitability criteria for the Forest Plan are incorporated by reference into this report, and a brief description of each component is provided in Section 2. Sanpoil project activities are consistent with LMP Desired conditions, Objectives, Standards and Guidelines as discussed in section 7.2 and 7.3 of this report.

Ferry County Community Wildfire Protection Plan

Proposed treatments are consistent with the goals outlined in the Ferry County Community Wildfire Protection Plan (CWPP). Treatments within the rural lands WUI designation and shaded fuel break treatments support meeting goals 1, 2, 5 and 6 of the CWPP.

10.0 - Other Relevant Mandatory Disclosures

10.1 - Intensity Factors for Significance (FONSI) (40 CFR 1508.27(b))

The proposed underburning, mechanical and non-mechanical treatments as well as initiating maintenance burning in the Eagle Rock units would help maintain and move stands from their current FRCC state to a more natural fire regime. The proposed shaded fuel breaks along the key ingress and egress routes would allow firefighters to engage a wildfire during initial attack or take strategic suppression action on a fire incident around the treated area. The shaded fuel break is not intended to stop a wildfire on a 97% fire weather day. It is intended to create defensible space and create an opportunity for fire fighters to safely engage wildfire.

Air quality has a low probability of being impacted during fuels treatments, fire managers will follow policy and direction from Washington State Smoke Management and get clearance before any prescribed fire operation begin.

Firefighter and public safety would improve with the proposed post-harvest and hazardous fuels reduction plans. Reducing crown, ladder and surface fuels reduces fire intensity allowing fire fighters to safely engage fire during initial attack, reduces the number of firefighters needed to control the fire, which lessons the exposure on firefighters and the public.

Forest resilience to wildfire would improve with the proposed post-harvest and fuel treatments by moving stands closer to historic fire regimes, reduce encroachment of fire intolerant species and reduce fuel loading across the landscape.

Public Health and Safety

Smoke from prescribed fire activities may temporarily settle within the Sanpoil analysis area and nearby Sanpoil River valley (Republic, Malo, and Curlew). Nevertheless, potential impacts to air quality from prescribed fires would be reduced due to reduced fuel consumption within a given area and by redistributing the emissions through meteorological scheduling and coordination with the WA DNR.

Meteorological scheduling is often the most effective way to minimize direct smoke impacts to the public (Ottmar et al. 2001). Prescribed burns would be scheduled and approved by the WA DNR during periods of good atmospheric dispersion (dilution), and when prevailing winds are forecasted to transport smoke away from sensitive areas (avoidance). In addition, total emissions from proposed activities would be spread out over a one to ten year implementation period.

Socio-political considerations and/or unfavorable changes in transport winds may necessitate a curtailment in prescribed burning at the local level. This would be determined on a case-by-case basis with a change in forecasted burn conditions communicated to the WA DNR.

Proposed activities meet or exceed the requirements of the Clean Air Act through compliance with air quality standards regulated by the WA DNR. Burn plans, outlining required weather and fuel parameters for desired fire and smoke effects, would be prepared and approved for each prescribed burn. Prescribed burning would also be consistent with State laws requiring treatment of activity created fuels.

11.0 - Other Agencies and Individuals Consulted

Consultation occurred with the Colville Confederated Tribes regarding fuels treatments along the Colville National Forest and the Colville Confederated Tribe's Boundary on the southern portion of the Sanpoil Project area.

Participated in or hosted 4 meetings with Tribal fuel planners Cody Desautel, Jason Fulfer and John Elliot discussing strategic areas to implement fuel treatments.

Presented several draft plans of fuels treatments to the Northeast Washington Forestry Coalition (NEWFC).

Met with Dave Konz from Double D Wood Products, who showed interest in a small firewood sale in the Sanpoil project area.

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